Nanosized Linde Type A Zeolites Providing Water-Selective Transport Pathways Through Chlorine Tolerant Polymers in Molecular Sieve Nanocomposite (MoSIN) Membranes for Reclamation of Impaired Waters

Completed Technology Project (2013 - 2016)

Project Introduction

One of the challenges currently faced by NASA is providing clean water from the limited supplies available in the isolated environment of a space shuttle or station. A viable option is recycling water from all available sources, namely urine and urine brine, through the use of membrane processes such as reverse osmosis (RO). We propose a membrane that consists of a thin polymer top layer containing molecular sieve nanoparticles that are highly selective for water, applied to a porous support layer that will allow for high water flux. Corrosion resistant materials will be chosen through systematic testing with synthetic urine solutions, and the fundamental factors controlling film formation will be investigated in detail to better control the quality of the final product. An appropriate polymer will be chosen to act as a total barrier to all substances, including small molecules such as urea, commonly found in urine. Such substances are very poorly rejected by commercial reverse osmosis membranes, leading to their complete inapplicability in such separations. By incorporating molecular sieve nanoparticles, water flux and separation factors will be drastically increased compared to pure polymer membranes that are tailored to allow for water permeation. While a nanoparticle-only membrane would provide very high water flux, such membranes are brittle, and require high temperatures to produce. Our membrane design will likely provide excellent separation, decreased cost of production over nanoparticle-only membranes, flexibility and long-term durability.

Anticipated Benefits

Our membrane design will likely provide excellent separation, decreased cost of production over nanoparticle-only membranes, flexibility and long-term durability. This will help enable the provision clean water from the limited supplies available in the isolated environment of a space shuttle or station.

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Table of Contents

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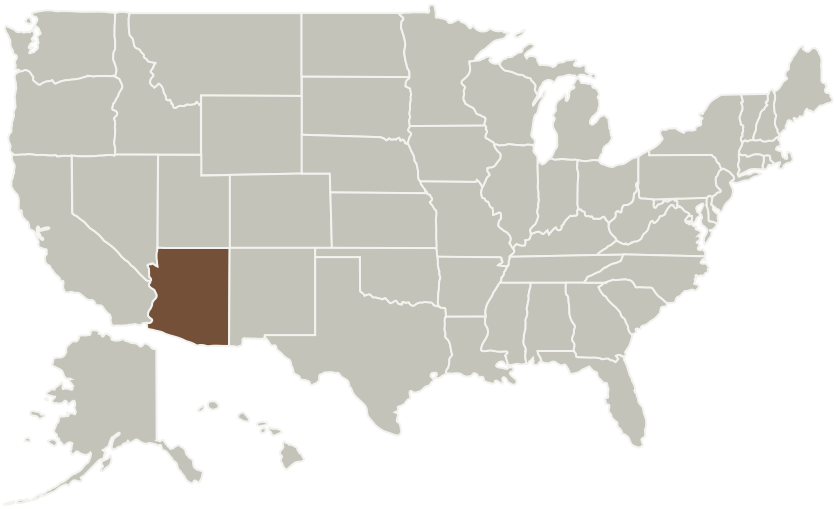
Completed Technology Project (2013 - 2016)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Arizona State University-Tempe(ASU)	Lead Organization	Academia Alaska Native and Native Hawaiian Serving Institutions (ANNH)	Tempe, Arizona

Primary U.S. Work Locations
Arizona

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Arizona State University-Tempe (ASU)

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Mary Lind

Co-Investigator:

Heather L Jamieson

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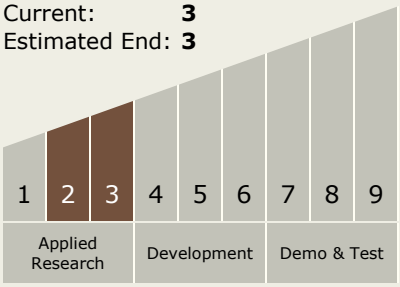
Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.2 Water Recovery and Management

Target Destination

Mars